

# On orbit measurement of response vs. scan angle for the infrared bands on TRMM/VIRS

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## ABSTRACT

The Visible and Infrared Scanner on the Tropical Rainfall Measuring Mission (TRMM/VIRS) is a whiskbroom imaging radiometer with two reflected solar bands and three emissive infrared bands. All five detectors are on a single cooled focal plane. This configuration necessitated the use of a paddlewheel scan mirror to avoid the effects of focal plane rotation that arise when using a scan mirror that is inclined to its axis of rotation. System radiometric requirements led to the need for protected silver as the mirror surface. Unfortunately, the SiO<sub>x</sub> coatings currently used to protect silver from oxidation introduce a change in reflectance with angle of incidence (AOI). This AOI dependence results in a modulation of system level response with scan angle. Measurement of system response vs. scan angle (RVS) was not difficult for the VIRS reflected solar bands, but attaining the required accuracy for the IR bands in the laboratory was not possible without a large vacuum chamber and a considerable amount of custom designed testing apparatus. Therefore, the decision was made to conduct the measurement on-orbit.

On three separate occasions, the TRMM spacecraft was rotated about its pitch axis and, after the nadir view passed over the Earth's limb, the VIRS performed several thousand scans while viewing deep space. The resulting data has been analyzed and the RVS curves generated for the three IR bands are being used in the VIRS radiometric calibration algorithm. This, to our knowledge, the first time this measurement has been made on-orbit. Similar measurements are planned for the EOS-AM and EOS-PM MODIS sensors and are being considered for several systems under development.

The VIRS on-orbit results will be compared to VIRS and MODIS system level laboratory measurements, MODIS scan mirror witness sample measurements and modeled data.

**Keywords: VIRS, on-orbit calibration, spacecraft maneuvers, reflectance, infrared, imaging radiometry**

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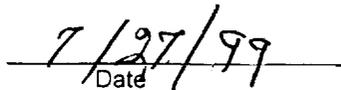
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1/8/1999

# Remote Sensing

**20-24 September 1999**

University of Florence, Italy

**Symposium Chairs:**

Hatem Nasr, Baker Hughes, Houston, Texas USA

Luca Pantani, CNR-IROE, Florence, Italy

**Symposium Co-Chair:**

Enzo Pranzini, University of Florence, Italy

**Sponsored by**

University of Florence, Italy - Department of Earth Science

EOS - The European Optical Society

SPIE - The International Society for Optical Engineering

CNR - The National Research Council of Italy

NASA - National Aeronautics and Space Administration

SIOF - Italian Society of Optics and Photonics

## Invitation to Attend

A few decades ago aerial photography, photogrammetry, and radio ionospheric studies gave birth to the field of remote sensing, with some of the most dramatic developments occurring during World War II. Various national space programs helped evolve the technology into what it is today and made it a viable tool for environmental monitoring and other very practical applications. Today, remote sensing is one of the fastest growing technologies around. It is a multibillion dollar industry and remote thematic images are routinely used in an increasing number of fields. Remote sensing data has even become part of our daily lives. Weather satellites are the primary source for weather forecasting. Satellite data is being used today for crop forecasting, mining and exploration, archeological discoveries, and even real estate development, to name a few. This was almost unimagined a couple of decades ago. In the next millenium, as the technology continues to evolve, we will witness an even faster growth of remote sensing applications and commerce.

Today, there are very few yearly conferences on Remote Sensing that offer a comprehensive coverage of scientific topics, applications, sensors, systems and satellite platforms. The EUROPTO® Symposium is one such conference. The EUROPTO® Symposium also brings a unique blend of international participants, where over 20 countries have been represented every year. The remote sensing community has four main participants:

- Scientists, who research new sensors, data processing techniques, phenomenology, and applications;
- Industry, which develops new platforms and sensors and engages in the commerce of remote sensing technology;
- Users, who employ remote sensing products for their daily needs;
- Governments, which want to develop the technology to improve and protect their societies and promote commerce.

We invite participants from all these communities to participate in our next EUROPTO® Symposium on Remote Sensing in Florence, Italy, 20-24 September 1999. This Symposium is the sixth in this series. We continue to improve on this meeting. Last year's very successful Symposium in Barcelona attracted about 400 participants. This will be a unique forum to get informed and debate the state of the art of the technology: sensors, platforms, and applications.

Eleven conferences will be held in the framework of the Symposium. Each conference will include oral presentations and posters. We warmly invite you to participate in the EUROPTO® Symposium on Remote Sensing. We are working hard to make it a symposium of the highest quality.

**Hatem Nasr**  
Baker Hughes, Houston, Texas

**Luca Pantani**  
CNR-IROE "Nello Carrara", Florence, Italy

## Including:

- Atmospheric Sensing
- Earth Surface Sensing
- Platforms and Systems

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39-55-49 133

## Laser Radar, Techniques (Ranging and Atmospheric Lidar) III (102)

Conference Chairs: **U. Schreiber**, TU Munich, Koetting, Germany, **Ch. Werner**, DLR, Oberpfaffenhofen, Germany

Conference Co-Chairs: **K. Asai**, Tohoku Institute of Technology, Sendai, Japan; **P. Ingman**, ESA-ESTEC, Noordwijk, The Netherlands; **P. Flamant**, CNRS, Palaiseau, France; **M. Huffaker**, CTI, Lafayette, CO USA; **M. Kavaya**, NASA, Huntsville, AL USA; **G. Matvienko**, IAO, Tomsk, Russia; **N. Sugimoto**, NIES, Ibaraki, Japan; **I. Prochazka**, TU Prag, Czech Republic; **John Degnan**, NASA, Greenbelt, MD USA; **G. Bianco**, ASI, Matera, Italy; **D. Winker**, NASA, Langley, MD USA

The major interest of this conference is focused on Satellite / Lunar Laser Ranging (S/LLR) and Atmospheric Lidar. SLR contributed a lot to the earth sciences over the last two decades, enhancing the resolution of the measured ranges continuously. Nowadays the domain below one centimetre has been reached. Therefore, the structure of the targets and the rapidly changing propagation properties of the atmosphere and a high level of system stability have become relevant. Multiple sensor models, near real-time data consistency checks in clustered stations and in situ measurements of atmospheric parameters via remote sensing techniques are becoming keywords of a mm-level SLR community.

There are a lot of similarities between SLR and lidar, beginning from the laser radar technique and ending in the application for atmospheric monitoring or correction. Tomography is a new technique that can be applied from ground stations using retro-reflectors in space or from space using hard targets on the ground. There are lidars or laser radars in orbit. Results of these sensors and discussions of planned missions are the goal of the second part of the conference.

The conference will be the continuation of the Europto® London conference in 1997 and is aimed to be a market for ideas. The session chairs are advised to stimulate the discussion. Therefore the number of accepted papers is limited to relevant new material and one or two invited papers. It is planned to provide time for extended discussions (accompanied with wine and cheese) to trade ideas or to present problems for discussions.

For the atmospheric propagation conference again a joint session is scheduled on the multiple scattering aspect.

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## Optics In Atmospheric Propagation and Adaptive Systems V (102)

Conference Chairs: **Anton Kohnle**, FGAN - Forschungsinstitut für Optik, Tübingen, FR Germany; **John D. Gonglewski**, Philips Laboratory, Kirkland AFB, New Mexico, USA

Conference Co-Chairs: **Luc R. Bissonnette**, Defence Research Establishment, Valcartier, Canada; **Piero Bruscaioni**, University of Florence, Florence, Italy; **J. Christopher Dainty**, Imperial College of Science, London, United Kingdom; **Adam D. Devir**, EORD, Technion, Haifa, Israel; **Marc Séchaud**, ONERA, Paris, France; **Mikhail A. Vorontsov**, U.S. Army Research Labs., Adelphi, MD USA

The use of satellites and high elevated platforms for active and passive remote sensing of earth and its atmosphere, as well as for high resolution imaging of ground-based and airborne objects, is a field of growing interest from civilian and military perspectives. Different sophisticated systems are currently used or scheduled for deployment for the purpose of covering the spectral regions from UV to CM waves. The measurement analysis depends crucially on the thorough understanding of all optical effects that limit the sensor performance through an atmosphere that acts as an absorbing, scattering, and radiating random medium.

High resolution space to ground (or ground to space) imaging is very much dependent on the long path geometries involved, especially due to altitude-dependent atmospheric propagation parameters and different radiating backgrounds.

Papers are solicited on the following and related topics:

- Imaging (band, spectral and hyperspectral) of ground-based and airborne objects from space and vice versa;
- Techniques for mitigation of atmospheric effects on imaging: adaptive optics, deconvolution, sensor fusion, post processing etc;
- Propagation and imaging through inhomogeneous dense media; multiple scattering effects on LIDAR and imager performance;
- Propagation and imaging through optical turbulence, including strong turbulence regimes;
- Propagation models and correction methods for atmospheric effects in remote sensing;
- Statistics of propagation parameters, statistics of cloud free line of sights, etc. Effects of depolarisation, pulse stretching, loss of coherence for active (laser) systems;
- Characterisation of the propagation environment: profiles of temperature, humidity, extinction, refractivity, radiance (also non-LTE), optical turbulence; updates of transmission and radiance codes.

A special session is planned to combine this conference with the conference on Laser Radar Techniques. The session will be dedicated to multiple scattering effects with respect to laser propagation and backscattering.

## Remote Sensing of Clouds and the Atmosphere (103)

Conference Chair: **Jacqui Russel**, Imperial College, London, United Kingdom

All aspects of the remote sensing of clouds and the atmosphere is the focus of this conference but special emphasis will be placed on:

- High spectral resolution observations
- Polarised measurements and their interpretation
- Radar and passive microwave measurements
- Lidar measurements

Topics will include:

- Cloud detection and characterization
- Cirrus
- Scattering and absorption by nonspherical particles
- Temperature and humidity profiling
- Lidar, microwave and radar measurements
- Inversion problems and techniques
- Remote sensing of ozone, aerosols, and trace gases
- Earth radiation budget
- Sensor systems and requirements for future satellites

Conference Chairs: **Edward W. Taylor**, Air Force Research Lab, USA, **Francis Berghmans**, SCK CEN, Mol, Belgium

Program Committee: **H. Thienpont**, Vrije Universiteit, Brussels, Belgium; **Marc Decreton**, SCK-CEN, Brussels, Belgium, **Marco Van Uffelen**, Roger Greenwell Science Engineering Associates, USA; **Tracy D. Hudson**, US Army Aviation and Missile Command, USA; **Joseph Suter**, Johns Hopkins Applied Physics Lab, USA; **Charles Barnes**, Jet Propulsion Laboratory, USA; **Karl Gill**, CERN, Switzerland; **Michael Watson**, NASA Marshall Space Flight Center, Greenbelt, MD USA; **Steven D. Pearson**, NASA Marshall Space Flight Center, Greenbelt, MD USA; **Marek Osinski**, University of New Mexico, USA

The objective of this conference is to bring together researchers, component developers and systems designers currently addressing the application, functionality, survivability, endurance, and cost effectiveness of photonic technologies in radiation environments.

The rapid growth and implementation of fiber optics and photonic devices in commercial and military systems has evolved to the stage of several recent demonstrations and applications in space and enhanced radiation environments. Specific applications of photonics in radiation environments found in nuclear reactors and those of importance to satellite systems will be the theme and focus of this Conference.

New and emerging photonic materials, components and systems that are under study or contemplated near term applications to improve or replace traditional electronics based sensors, processors, correlators, data links, trackers, communications and other military and commercial technologies are encouraged for presentation at this Conference.

Photonic systems and components such as laser diodes, light emitting diodes, vertical cavity surface emitting lasers, detectors, organic and inorganic modulators, integrated optic devices and spatial light modulators, as well as optical couplers, fiber optic amplifiers, optical fibers and other photonic innovations contemplated for space and reactor applications must be understood and quantified for their responses in the natural space and enhanced radiation environments. Authors are encouraged to present papers on new applications and research directions, advanced component and system developments as well as experimentation and theoretical modeling for understanding radiation induced effects in photonic materials and components.

Papers are solicited on the following and related example topics:

- planned and proposed photonics and fiber optics nuclear reactor and space experiments.
- Quantification and qualification of photonic systems, materials and component responses in radiation environments
- modeling of radiation environments-photonic responses
- MEMS-MOEMS system and component radiation effects studies
- optical interconnects and optical bus architectures for space systems
- advances in photonic materials suitable for radiation applications
- research emphasizing FO components and systems.

Conference chair: **Joan Lurie**, Datron/Transco, Inc., Hermosa Beach, CA USA

Program Committee: **Richard Genet**, Marconi Integrated Systems (formerly GDE Systems); **Gary Gnauck**, Datron/Transco; **Jacques Huyghe**, PLAN; **Stephen Lutton**, Core Software Technology; **Craig Molander**, PCI Geomatics; **Timothy Puckorius**, Orbimage.

Over the next several years new satellite imaging systems, many launched by commercial companies, will collect remotely sensed data of differing resolutions in a variety of spectral bands. An unprecedented quantity and quality of data will be commercially available in a very short time after acquisition.

The potential utility of the data for solving a wide variety of problems is unquestioned but, in many cases, the commercial viability is unproven. This data is only useful (and the systems producing it commercially viable) if products derived from it can be shown to be readily understandable by the user and lead to enhanced profitability. Tools to convert imagery to information will be play a crucial role in the commercial marketplace. Equally important will be the ability to store and distribute the data in a timely manner. Another issue is the potential use of multiple data types (e.g. high resolution panchromatic and multispectral) to solve problems.

The object of this conference is to address the field of commercial remote sensing and help clarify market issues, commercial utility of remotely sensed data and data products, and associated legal issues. There will be sessions on space systems, on ground station technology to facilitate commercial use of data, on tools and on applications. Abstracts may address a wide range of subjects but should focus on the commercial aspects. Suggested topics include:

- Satellite systems for commercial remote sensing
- Tools which facilitate product generation for the commercial market place
- Data fusion tools
- Archiving and distribution tools
- "Exploitation" tools to extract information from imagery
- Ground stations – how to adapt to commercial customer requirements
- New stations
- Upgrades to existing stations
- Legal issues, licenses, liability
- Commercial Applications – what is the market and what are the products?
- Agriculture
- Communications
- Real Estate
- Insurance
- Forestry

## Microelectronic Manufacturing Technologies

19-21 May 1999  
Caledonian Hotel  
Edinburgh, United Kingdom  
Abstract Due date: 7 October 1998  
Manuscript Due date: 12 February 1999

## Optical System Design and Production

25-28 May 1999  
Technical University of Berlin  
Berlin, Germany  
Abstract Due date: 26 October 1998  
Manuscript Due date: 26 April 1999

## Industrial Lasers and Inspection

14-18 June 1999  
Munich, Germany  
Abstract Due date: 27 November 1998  
Manuscript Due date: 17 May 1999

## Envirosense

14-18 June  
Munich, Germany  
Abstract Due date: 27 November 1998  
Manuscript Due date: 17 May 1999

## Remote Sensing

20-24 September 1999  
University of Florence  
Florence, Italy  
Abstract Due date: 8 March 1999  
Manuscript Due date: 23 August 1999

Conference Chair: **Eugenio Zilioli**, CNR-IRRS,  
Milan, Italy

Conference Co-Chair: **Magaly Koch**, Boston  
University, Boston, MA USA

Satellite remote sensing has become a common tool of the investigation in the different fields of Earth science. The progress of the performance capabilities of the optoelectronic devices mounted on-board space platforms have further improved the capability of instruments to explore inside the structure of the lithosphere and related resources, and to achieve the necessary information for a land-use global assessment, allowing us to make expanded and more detailed use of the electromagnetic spectrum. Satellite imagery is also an important complementary support in the description of spatial distribution of urban areas and archaeological sites, being largely dependent on environmental characteristics such as landform, soil fertility, rock type, water proximity, climatic conditions.

The present conference will be an occasion to outline how scientists involved in the Earth studies can take advantage of new remote sensing techniques, what their needs are, and what perspectives are just around the corner for tomorrow.

Particular subjects are:

- Imaging spectrometry and its hyperspectral dimension
- Image texture and spatial analysis and the 3-D computer vision
- Radar interferometric techniques to detect small displacements in relation to geodynamic events
- GIS for retrieval of land resource information
- Integration between remote sensing and geophysical prospecting

This announcement is an invitation to present new research results in these fields of satellite remote sensing applications in the following and related topics:

- Structural geology and tectonics
- Mineral and petroleum exploration
- Hydrogeology in arid and semi-arid zones
- Landform analysis and Quaternary geology
- Lithological classification and mapping
- Geological hazard and land degradation
- Soil properties and land-use classification
- Archaeological site identification
- Paleo-environmental reconstruction
- Infrastructures and urban areas

Conference Chair: **Giovanna Cecchi**, CNR-IROE,  
Florence, Italy

Conference Co-Chairs: **Charles Bostater**, Florida  
Institute of Technology, Melbourne, FL USA;  
**Rosalia Santoleri**, IFA CNR, Rome, Italy

Remote sensing has proven to a very useful tool for research of oceanic features and sea ice. It is applied in ocean and ice dynamics studies and in connection with monitoring of sea ice as data input to numerical modelling. Nevertheless, there are still a number of outstanding issues and there are good reasons to attempt to improve the accuracy of the retrieval of related geophysical parameters. In this context, it is often necessary to integrate data from different sensors as well as to include the knowledge of different disciplines. Another important field is the remote sensing of sea-water quality, such as suspended sediments, dissolved organic matter, phytoplankton, vegetation beds, and pollutants. From a remote sensing point of view these data are mainly extracted by passive (Ocean Colour) and active optical sensors, operating either from satellite or from airplane or other platforms.

The Conference on remote sensing of the ocean and sea ice should address the following issues of application of data from a variety of sensors, combined with meteorological, physical, biological, chemical, and geological data:

- Ocean currents and fronts
- Detection of deep water formation
- Water-quality monitoring
- Sea ice classification and sea ice dynamics
- Studies and modelling of microwaves and optical signatures of sea and ice
- Studies of shore-fast ice with interferometry
- Multi-satellite, sensor integration, and sensor studies
- Data fusion
- Regional and global sea ice monitoring in climate change research
- Operational monitoring systems and their requirements

Conference Chair: **Francesco Posa**, Università  
Politecnica di Bari, Italy

In recent years there have been many new developments in the field of SAR Image analysis. These range from a host of environmental applications such as the monitoring of deforestation and crop studies to issues involved with military reconnaissance. It is clear that there are particular properties of SAR images that demand fundamentally different interpretation techniques from conventional optical imagery. In principle, one wishes to derive the scene given the data that is a classic ill-conditioned inverse problem. This type of problem is approached by rigorous exploitation of all the information within the image combined with realistic prior knowledge about the properties of the scene, usually contained some model. This model may be phenomenological, based on observed properties, or derived from scattering theory. The scattering theory approach is critically dependent on detailed modelling and simulation techniques to describe the forward problem in terms of different objects of varying size, shape and material.

The conference is intended to present an updated view of the state-of-the-art techniques in image interpretation, based on the above models as well as applications of these models to all areas of remote sensing.

Contributions are solicited on the following and related topics:

- Spaceborne and airborne SAR and IFSAR
- SAR and IFSAR processors: algorithms, architectures, dedicated hardware
- Use of neural net for automated SAR and IFSAR processing
- Multiangle, multipolarisation, multi-frequency SAR and IFSAR
- Techniques for generating geometrically and radiometrically correct SAR images
- Statistical properties of remote sensed images, including polarisation and wavelength effects
- Phenomenological and theoretical models for rural and urban scenes
- Inversion and information extraction techniques: despeckling and segmentation
- Phase unwrapping and super-resolution
- Modelling and simulation of ocean waves, rural, and urban areas
- Applications to remote sensing-geological atmospheric, etc.
- High-speed processing algorithms and architectures
- Validation and information fusion

## Sensors, Systems and New Generation Satellites (V) (1507)

Conference Chair: **Hiroyuki Fujisada**, Science University of Tokyo, Noda, Chiba, Japan

Conference Co-Chairs: **S. P. Neeck**, NASA/GSFC, Greenbelt, MD USA; **H. Shimoda**, Tokai Univ., Tokyo, Japan; **G. Ceruti-Maori**, Aerospatiale, Cannes La Bocca, France; **R. Meynart**, ESTEC, Noordwijk, Netherlands; **R. Somma**, Alenia Aerospazio S.p.A., Rome, Italy; **E. Sein**, Matra Marconi Space, Toulouse, France; **P. N. Slater**, University of Arizona, Tucson, AZ USA

Many new remote sensing programs are under way throughout the world, specifically by U.S., European countries and Japan. NASA's office of Earth Science Enterprise (ESE) is developing plans for a series of programs including EOS, Landsat, Earth System Science Pathfinder (ESSP), and New Millennium Earth Orbiting flight. Japanese NASDA has a series of ADEOS and ALOS programs. ESA has ENVISAT and METOP programs. Each of these programs is developing a set of remote sensing systems to address their science objectives.

Papers are solicited on the following and related topics:

- Sensors being developed.
- Satellites being developed.
- Technologies required to enable these sensors and satellites.
- New design concepts of sensors, systems and satellites.
- Hyper spectral sensors in space.
- Sensor calibration techniques.
- Modeling and simulation techniques for sensor concept development.
- Focal plane assemblies including detectors and spectral filters.
- Space cryogenics
- System precursors including test beds and airborne simulators.
- Data system being developed.
- New data processing techniques.

Sessions on the following topics are being planned:

- ADEOS/ALOS mission and technologies.
- ENVISAT/METOP mission and technologies.
- ESE mission and technology
- New satellite technologies (navigation, on-board data processing, cooling system, etc.).
- Calibration.
- Hyper spectral sensors (mission analysis, design, performance, technologies, airborne sensors, etc.).

## Remote Sensing for Agriculture, Ecosystems, and Hydrology (III) (1508)

Conference Chairs: **Ted Engman**, NASA-GSFC, Greenbelt, MD USA

Conference Co-chairs: **G. D'Urso**, University of Napoli "Federico II" Napoli, Italy; **Jesus Gonzalo de Grado**, Ingegnaria y Servicios Aeroespaciales, SA, Madrid, Spain, **Mario Caetano**, Centro Nacional de Informacao Geografica, Lisboa, Portugal

Remote sensing has been responsible for major advances in our understanding and ability to manage agriculture, forestry and water resources. In spite of this progress there are still many areas where the potential of remote sensing has not been fully realized and these are areas of active research. Much of the new research is directly related to the development of new sensors and an improved understanding of what the sensors are actually measuring as well as new and improved analysis techniques.

This session seeks papers on new applications of remote sensing and recent research results in agriculture, forestry, and hydrology. Contributions using visible, near and far infrared, thermal infrared and microwave measurements are requested, but special consideration will be given to papers addressing use of satellite data or proposing synergism of different sensors.

Papers are requested that address the following and related topics:

- Agriculture, including crop yield modeling, early warning, disease and insect damage, drought effects, crop monitoring at regional and global scales, radiative transfer modeling of vegetation canopies, and related topics;
- Ecosystems, including forest management, biomass estimates, LAI/FPAR products, vegetation indices, land cover products, fires, deforestation, urban ecosystems, radiative transfer modeling of ecosystem properties, and related topics;
- Hydrology including parameterization of regional and macro hydrological models, water resource monitoring, estimates of latent and sensible heat, snow, soil moisture, urban hydrology, water quality, sedimentation, and erosion, and related topics;

## Image and Signal Processing for Remote Sensing (V) (1509)

Conference Chair: **Sebastiano Serpico**, University of Genoa, Italy

Conference Co-chairs: **J. A. Benediktson**, University of Iceland, Iceland; **C. H. Chen**, Univ. of Massachusetts at Dartmouth, USA; **J. Desac**, Univ. Paul Sabatier, Toulouse, France; **M. Pet**, Univ. of Surrey, United Kingdom

Scientific Committee: **E. Binaghi**, CNR ITIM, Milan, Italy; **I. Bloch**, ENST, Paris, France; **P. Blonda**, CNR IESI, Bari, Italy; **L. Bruzzone**, Univ. Genoa, Italy; **M. Datcu**, DLR, Oberpfaffenhof, Germany; **S. Dellepiane**, Univ. of Genoa, Italy; **S. Fujimura**, Univ. of Tokyo, Japan; **I. Kanellopoulos**, JRC, Ispra, Italy; **D. Landgreber**, Purdue University, USA; **D. C. Mason**, ESSC, University of Reading, United Kingdom; **M. Migliaccio**, University of Cagliari, Italy; **J. Rason**, FUNDP Univ. Namur, Belgium; **P.C. Simoni**, JRC, Ispra, Italy

The main goal of this conference is to examine all aspects of image and signal processing for remote image analysis and understanding. Papers describing recent and original work on the following and related research topics are welcome:

- Signal and image enhancement and restoration
- Registration techniques
- Stereoscopic images analysis
- Shape and texture analysis
- Image segmentation and object recognition
- Multisensor and multisource techniques
- Data fusion
- Statistical, structural and hybrid pattern recognition techniques
- Integration of remotely sensed data and geodata
- Neural techniques
- Scene analysis and image understanding
- Knowledge-based image understanding
- Expert systems, fuzzy logic, and AI techniques

Note: Those wishing to participate in this conference should prepare extended 500 word abstracts on two A4 pages. All other abstract submission instructions should be followed.

**Abstract Due Date**  
**8 March 1999**

**Manuscript Due Date**  
**23 August 1999**

YOUR ABSTRACT SHOULD INCLUDE:

- 1. SUBMIT TO:** Remote Sensing Conference Title/Conference Chair/Conference Code (rs01, rs02, etc.)
- 2. ABSTRACT TITLE**
- 3. AUTHOR LISTING** (principal author first) First (given) name Last (family) name, affiliation, mailing address, telephone, telefax, and e-mail address.
- 4. CORRESPONDENCE FOR EACH AUTHOR**
- 5. PRESENTATION**  
Please indicate your preference for either "Oral Presentation" or "Poster Presentation". Placement is subject to chairs' discretion.
- 6. KEY WORDS (3-5)**
- 7. ABSTRACT TEXT** one full A4-page typed on white paper. The abstract should be divided into background, materials and methods, results, and discussion. Emphasize the main contribution of the work; the original contribution with respect to the state of the art; and include references to related papers from the same authors. Report your results in detail.
- 8. BRIEF BIOGRAPHY** (principal author only) Approximately 50 to 100 words.

### CONDITIONS OF ACCEPTANCE

- Authors are expected to secure travel and accommodation funding, **independent of the organisers**, through their sponsoring organisations before submitting abstracts.
- Only original material should be submitted.
- Commercial papers, description of papers, with no research content, and papers where supporting data or a technical description cannot be given for proprietary reasons will not be accepted for presentation in this symposium.
- Abstracts should contain enough detail to clearly convey the approach and the results of the research.
- Government and company clearance to present and publish should be final at the time of submittal.
- Applicants will be notified of acceptance by mail no later than **5 April 1999**.

### PAPER REVIEW

To ensure a high quality conference, all abstracts and Proceedings papers will be reviewed by the conference chairs for technical merit and content.

### ORAL OR POSTER PRESENTATION

Instructions for Oral and Poster presentations will be included in your author kit. All Oral and Poster presentations are included in the Proceedings and require a manuscript.

### INSTRUCTIONS FOR SUBMITTING ABSTRACTS

Please choose only one of the following options and send by the due date:

- E-mail each abstract separately to: [europto@associationhq.com](mailto:europto@associationhq.com) in ASCII text (not encoded). IMPORTANT: to ensure receipt and proper processing of your abstract, the Subject line must include only the following: Example: SUBJECT: rs01 (or code listed after the conference title). Attachments in Word only.
- or mail three copies of your abstract to:  
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### PUBLISHING POLICY

**Manuscript due dates must be strictly observed.** Whether the conference volume will be published before or after the meeting, late manuscripts run the risk of not being published in the Proceedings. The objective of this policy is to better serve the conference participants and the technical community at large. Your cooperation in supporting this objective will be appreciated by all.

### PROCEEDINGS

These meetings will result in published Proceedings available for order through the Advance Programme. Manuscripts are required of all accepted applicants and must be submitted in English by **23 August 1999**. Copyright to the manuscript is expected to be released for publication in the conference Proceedings. Note: If an author does not attend the meeting and make a presentation, the chair may choose not to publish the author's manuscript in the conference volume. Papers published are indexed in leading scientific databases including INSPEC, Compendex Plus, Physics Abstracts, Chemical Abstracts, International Aerospace Abstracts and Index to Scientific and Technical Proceedings.

### ORAL PRESENTATION

Each author is generally allowed 15 minutes plus a five-minute discussion period. The following media equipment is provided free of charge: 35 mm slide projectors, overhead projectors, and flipcharts. Video and other equipment may be provided upon request.

### AUTHOR BENEFITS

Authors and co-authors are expected to pay a reduced registration fee. Included with a fee payment is a copy of the Proceedings volume in which the participant's role or paper appears.

### Preliminary Registration Fees

With the introduction of the EURO in January 1999, conference fees will be charged in Euro's.

	Euros	(Ref. only)
Authors :		
EOS/SPIE Member	325	(~\$380)
Nonmember	375	(~\$439)
Attendees :		
EOS/SPIE Member	400	(~\$468)
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Students :		
EOS/SPIE Member	150	(~\$176)
Nonmember	200	(~\$234)

Registration fee includes technical sessions, coffee breaks, reception, and 1 Proceedings volume for all but student fees.

### Meeting Venue

The symposium will be held at:

University of Florence  
Department of Earth Science  
Via Giorgio Lapira 4  
I-50139 Florence  
Italy

### Accommodation

Hotel Accommodations will be handled by the EUROPTO® Series staff. More information will be available in the Technical Programme.

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Italy is the holder of 40% of the world's artistic and historical treasures; 26% of these are in Florence. It is beautiful open sky museum where magnificent Italian Renaissance masterpieces can be discovered in every corner, day by day: Leonardo, Michelangelo, Raffaello, Tiziano, and many others can be admired through a short and pleasant walk, a few minutes from the conference citadel. Florence is also a busy cosmopolitan centre which offers in every season of the year many traditional musical and theatre festivals, historic cafés, excellent restaurants with international standards as well as typical picturesque "trattorie" serving the best region Italian cuisine. Fascinating excursions take the visitors to beautiful cities of Tuscany such as Pisa, Lucca, and Siena.

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